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(54) **High temperature melting braze materials for bonding niobium based alloys**

(57) This invention relates to a high temperature melting composition and method of using the composition for brazing high temperature niobium-based substrates, such as niobium-based refractory metal-intermetallic compositions (RMIC), including but not restricted to niobium-silicide composite alloys. The high temperature melting composition can include one or more alloys. The alloys include a base element selected from titanium, tantalum, niobium, hafnium, silicon, and germanium. The

alloys also include at least one secondary element that is different from the base element. The secondary element can be selected from chromium, aluminum, niobium, boron, silicon, germanium and mixtures thereof. When two or more alloys are included in the composition, it is preferable, but not required, to select at least one lower melting alloy and at least one higher melting alloy.; The composition is preferably a homogeneous mixture of the two or more alloys combined in powder form.

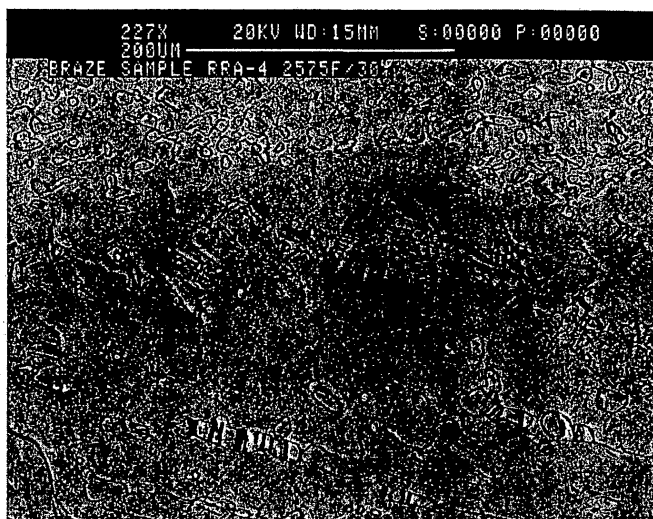


FIG. 1



EUROPEAN SEARCH REPORT

Application Number
EP 10 01 3176

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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			TECHNICAL FIELDS SEARCHED (IPC)
			B23K C22C
<p>1 The present search report has been drawn up for all claims</p>			
Place of search Munich		Date of completion of the search 29 June 2011	Examiner Patton, Guy
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document</p>			

EPO FORM 1503 03.82 (P04C01)



Application Number

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CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☒ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

see annex

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).



LACK OF UNITY OF INVENTION
SHEET B

Application Number

EP 10 01 3176

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 2-12, 14-20(completely); 1, 13(partially)

A braze composition comprising a Cr-Ti-Si low-melt alloy
(first or sixth composition) combined with a Nb-B high melt
alloy (eleventh or sixteenth composition)

2. claims: 1, 13(all partially)

A braze composition comprising a Cr-Ti-Si low-melt alloy
(first or sixth composition) combined with a Cr-Nb high melt
alloy (twelfth or seventeenth composition)

3. claims: 1, 13(all partially)

A braze composition comprising a Cr-Ti-Si low-melt alloy
(first or sixth composition) combined with a Al-Nb high melt
alloy (thirteenth or eighteenth composition)

4. claims: 1, 13(all partially)

A braze composition comprising a Cr-Ti-Si low-melt alloy
(first or sixth composition) combined with a Al-Ta high melt
alloy (fourteenth or nineteenth composition)

5. claims: 1, 13(all partially)

A braze composition comprising a Cr-Ti-Si low-melt alloy
(first or sixth composition) combined with a Nb-Ge high melt
alloy (fifteenth or twentieth composition)

6. claims: 1, 13(all partially)

A braze composition comprising a Ti-Si low-melt alloy
(second or seventh composition) combined with a Nb-B high
melt alloy (eleventh or sixteenth composition)

7. claims: 1, 13(all partially)

A braze composition comprising a Ti-Si low-melt alloy
(second or seventh composition) combined with a Cr-Nb high
melt alloy (twelfth or seventeenth composition)

8. claims: 1, 13(all partially)



**LACK OF UNITY OF INVENTION
SHEET B**

Application Number

EP 10 01 3176

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

A braze composition comprising a Ti-Si low-melt alloy (second or seventh composition) combined with a Al-Nb high melt alloy (thirteenth or eighteenth composition)

9. claims: 1, 13(all partially)

A braze composition comprising a Ti-Si low-melt alloy (second or seventh composition) combined with a Al-Ta high melt alloy (fourteenth or nineteenth composition)

10. claims: 1, 13(all partially)

A braze composition comprising a Ti-Si low-melt alloy (second or seventh composition) combined with a Nb-Ge high melt alloy (fifteenth or twentieth composition)

11. claims: 1, 13(all partially)

A braze composition comprising a Cr-Si low-melt alloy (third or eighth composition) combined with a Nb-B high melt alloy (eleventh or sixteenth composition)

12. claims: 1, 13(all partially)

A braze composition comprising a Cr-Si low-melt alloy (third or eighth composition) combined with a Cr-B high melt alloy (twelfth or seventeenth composition)

13. claims: 1, 13(all partially)

A braze composition comprising a Cr-Si low-melt alloy (third or eighth composition) combined with a Al-Nb high melt alloy (thirteenth or eighteenth composition)

14. claims: 1, 13(all partially)

A braze composition comprising a Cr-Si low-melt alloy (third or eighth composition) combined with a Al-Ta high melt alloy (fourteenth or nineteenth composition)

15. claims: 1, 13(all partially)

A braze composition comprising a Cr-Si low-melt alloy (third or eighth composition) combined with a Nb-Ge high melt alloy



LACK OF UNITY OF INVENTION
SHEET B

Application Number

EP 10 01 3176

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

(fifteenth or twentieth composition)

16. claims: 1, 13(all partially)

A braze composition comprising a Cr-Ti low-melt alloy
(fourth or ninth composition) combined with a Nb-B high melt
alloy (eleventh or sixteenth composition)

17. claims: 1, 13(all partially)

A braze composition comprising a Cr-Ti low-melt alloy
(fourth or ninth composition) combined with a Cr-B high melt
alloy (twelfth or seventeenth composition)

18. claims: 1, 13(all partially)

A braze composition comprising a Cr-Ti low-melt alloy
(fourth or ninth composition) combined with a Al-Nb high
melt alloy (thirteenth or eighteenth composition)

19. claims: 1, 13(all partially)

A braze composition comprising a Cr-Ti low-melt alloy
(fourth or ninth composition) combined with a Al-Ta high
melt alloy (fourteenth or nineteenth composition)

20. claims: 1, 13(all partially)

A braze composition comprising a Cr-Ti low-melt alloy
(fourth or ninth composition) combined with a Nb-Ge high
melt alloy (fifteenth or twentieth composition)

21. claims: 1, 13(all partially)

A braze composition comprising a Cr-Hf low-melt alloy (fifth
or tenth composition) combined with a Nb-B high melt alloy
(eleventh or sixteenth composition)

22. claims: 1, 13(all partially)

A braze composition comprising a Cr-Hf low-melt alloy (fifth
or tenth composition) combined with a Cr-B high melt alloy
(twelfth or seventeenth composition)



**LACK OF UNITY OF INVENTION
SHEET B**

Application Number

EP 10 01 3176

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

23. claims: 1, 13(all partially)

A braze composition comprising a Cr-Hf low-melt alloy (fifth or tenth composition) combined with a Al-Nb high melt alloy (thirteenth or eighteenth composition)

24. claims: 1, 13(all partially)

A braze composition comprising a Cr-Hf low-melt alloy (fifth or tenth composition) combined with a Al-Ta high melt alloy (fourteenth or nineteenth composition)

25. claims: 1, 13(all partially)

A braze composition comprising a Cr-Hf low-melt alloy (fifth or tenth composition) combined with a Nb-Ge high melt alloy (fifteenth or twentieth composition)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 10 01 3176

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

29-06-2011

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